

# Rambutan

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**Scientific Name and Introduction:** Rambutan fruit (*Nephelium lappaceum* L.) are large ovoid or globose fruit about 4.5 cm (1.8 in) long and 2.5 to 3.7 cm (1 to 1.5 in) wide that occur on woody stalks in clusters of 10 to 18. The outer skin is 2 to 4 mm (0.1 to 0.2 in) thick and covered with soft, long spines (spinterns) that turn red or yellow when ripe. The edible aril flesh is attached to a single, large seed. The fruit is related to litchi and longan (Nakasone and Paull, 1998).

**Quality Characteristics and Criteria:** Quality criteria include: fruit size, shape, and weight; bright skin and spine color; uniformity; absence of defects; and freedom from disease and insects. High SSC and low TA are desirable (Ketsa and Klaewkasetkorn, 1992). Mechanical injury and dehydration are major causes of appearance loss.

**Horticultural Maturity Indices:** Skin and spine coloration is the main horticultural maturity index. Fruit having green skin and greenish-red spines are sour. Fruit have both skin and spines red or yellow, depending upon variety. Between these two stages, sugar content increases about 20%, and acid levels are half that at the green stage (Mendoza et al., 1982). The acceptable stage is 16 to 28 days after color break, at which time skin and spines are brightly colored (O'Hare, 1992). Over-ripe fruit have a watery texture (Somboon, 1984) which may be a senescence-induced tissue breakdown.

**Grades, Sizes and Packaging:** There are no U.S. or International grade standards. Fruit are sold in 2.25 kg (5 lb) and 4.5 kg (10 lb), one-piece, fiberboard cartons. Sometimes fruit are pre-packed in punnets. In Southeast Asia, clusters of fruit are sold in bunches still attached to the stem

**Pre-cooling Conditions:** Only room-cooling is recommended.

**Optimum Storage Conditions:** Store at 8 to 15 °C (46 to 59 °F) with 90 to 95% RH to achieve a storage-life of 14 to 16 days. There may be changes in the skin and spine coloration after storage, but the flesh is unaffected. Temperature recommendations vary for different cultivars (O'Hare, 1992). Fruit held at 20 °C (68 °F) with 60% RH last about 3 to 5 days.

**Controlled Atmospheres (CA) Consideration:** CA of 7 to 12% CO<sub>2</sub> + 3 to 5% O<sub>2</sub> at 10 °C (50 °F) is recommended (Kader, 1993). At 9 to 12% CO<sub>2</sub> color loss is reduced and shelf-life extended by 4 to 5 days, while low O<sub>2</sub> (3%) has little affect (O'Hare et al., 1994; O'Hare, 1995). CO<sub>2</sub> levels >12% have no additional effect, and decay can begin after a few weeks storage. The MA/CA effect appears to be more via CO<sub>2</sub> elevation and minimizing water loss than through effect of low O<sub>2</sub>. Storage in sealed polyethylene film bags or plastic containers is effective in reducing water loss (Mendoza et al., 1972; Ketsa and Klaewkasetkorn, 1995; Mohamed and Othman, 1988), while wax coatings are less effective (Mendoza et al., 1972; Brown and Wilson, 1988; Lam and Ng, 1982). A shelf-life of 14 to 21 days can be expected.

**Retail Outlet Display Considerations:** Display preferably in trays with a clear film over-wrap or in clam shell containers with no perforations at 10 to 12 °C (50 to 55 °F). Do not mist or ice.

**Chilling Sensitivity:** If maintained at 5 °C (41 °F), fruit can be stored for up to 3 weeks, but the skin and spines change from red to brownish-red; the edible aril is white and remains in good condition (Lam and

Ng, 1982). Somboon (1984) reported that after 3 days at 5 °C (41 °F), the aril turned from white (translucent) to being more transparent and juicier.

**Ethylene Production and Sensitivity:** This non-climactic fruit has a very low rate of ethylene production at  $< 0.04 \mu\text{L kg}^{-1} \text{h}^{-1}$  (O'Hare et al., 1994). Higher rates of up to  $3 \mu\text{L kg}^{-1} \text{h}^{-1}$  can occur, if there is a fungal infection. The presence of  $5 \mu\text{L L}^{-1}$  ethylene in CA (9 to 12% CO<sub>2</sub>) or the presence of an ethylene absorber does not influence rate of skin color loss (O'Hare, 1995).

**Respiration Rates:** Respiration is 40 to 100 mg (about 23 to 57  $\mu\text{L}$ ) CO<sub>2</sub>  $\text{kg}^{-1} \text{h}^{-1}$  at 25 °C (77 °F). This is a non-climacteric fruit and the rates are for mature fruit; immature fruit respiration rates are higher (Mendoza et al., 1972). To calculate heat production, multiply  $\text{mg kg}^{-1} \text{h}^{-1}$  by 220 to get BTU per ton per day or by 61 to get kcal per metric ton per day.

**Physiological Disorders:** Chilling injury and darkening of spines and skin are major postharvest disorders. Darkening is due to dehydration and mechanical injury (Landrigan et al., 1996). Pre-harvest disorders include skin splitting and poor filling of fruit (O'Hare, 1992). Skin splitting occurs in thin skinned cultivars often following heavy rains during the last phase of fruit growth. Poor filling has been associated with poor nutrition and dry conditions just after flowering.

**Postharvest Pathology:** Postharvest losses due to disease are low (Ketsa and Klaewkasetkorn, 1992), though stem end rot and fruit rots are found. Sangchote et al. (1992) found that the spectrum of fungi associated with rambutan decay varied with storage temperatures. *Collectotrichum gloeosporioides* and *Botryodiplodia theobromae* are considered the most serious pathogens. Other pathogens recorded include *Pestalotiopsis* spp. and *Phomopsis* spp. (Farungasang et al., 1991).

**Quarantine Issues:** Rambutan is a fruit fly host, and the available treatments are irradiation and heat treatment. Heat treatment leads to rapid loss of skin color. Mealy bugs are often found on the fruit, but no damage to the flesh occurs (Ketsa and Klaewkasetkorn, 1992).

**Suitability as Fresh-cut Product:** Limited, since it is difficult to separate the aril and seed.

**Special Considerations:** None.

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